

### Patent Claims

1. Quartz glass crucible for crystal pulling with a crucible wall, comprising an outer layer of opaque quartz glass and an inner layer, wherein the outer layer has an inner region and an outer region, which is provided with a  
5 crystallization promoter that effects crystallization of quartz glass with formation of cristobalite when the quartz glass crucible is heated during intended use in crystal pulling, characterized in that the crystallization promoter contains a first component acting in quartz glass – additionally to silicon – as a network former and/or a network modifier in quartz glass and a  
10 second, alkali-metal-free component acting in quartz glass as a breakpoint former, and that the outer layer (6) comprises a doping region (8) having a layer thickness of more than 0.2 mm containing said components being entrapped therein.
2. Quartz glass crucible according to claim 1, characterized in that the first  
15 component acting as network former contains a tetravalent substance.
3. Quartz glass crucible according to claim 2, characterized in that the tetravalent substance is titanium ( $\text{Ti}^{4+}$ ), zirconium ( $\text{Zr}^{4+}$ ), hafnium ( $\text{Hf}^{4+}$ ), germanium ( $\text{Ge}^{4+}$ ) and/or tin ( $\text{Sn}^{4+}$ ).
4. Quartz glass crucible according to claim 1, characterized in that the second  
20 component acting as breakpoint former contains a divalent alkali-free-metal substance.
5. Quartz glass crucible according to claim 4, characterized in that the divalent, alkali-metal-free substance is barium ( $\text{Ba}^{2+}$ ) and/or strontium.
6. Quartz glass crucible according to one of claims 1 to 5, characterized in that  
25 the first and the second component have a distribution coefficient in silicon of  $10^{-5}$  max.

7. Quartz glass crucible according to one of claims 1 to 6, characterized in that the first component and the second component are each contained in a concentration ranging from 0.003 mol-% to 0.02 mol-% in the doping region.
8. Quartz glass crucible according to one of claims 1 to 7, characterized in that the first component and the second component are contained in the doping region (8) in the form of an oxide compound containing the said components.
9. Quartz glass crucible according to claim 8, characterized in that the oxide compound consists of a ternary oxide, such as barium titanate ( $\text{BaTiO}_3$ ) or barium zirconate ( $\text{BaZrO}_3$ ) or a mixture thereof.
10. Quartz glass crucible according to one of claims 1 to 9, characterized in that the doping region (8) has a layer thickness of more than 0.5 mm, preferably more than 2 mm.
11. Quartz glass crucible according to claim 10, characterized in that the layer thickness is 10 mm max.
12. Quartz glass crucible according to one of claims 1 to 11, characterized in that the quartz glass crucible has an essentially cylindrical side wall (4) about the axis of rotation (1), wherein the doping region (8) is formed as a doping strip in the side wall (4).
13. Method for manufacturing a quartz glass crucible according to one of claims 1 to 12 by producing a crucible base body comprising an outer layer of opaque quartz glass and an inner layer, wherein at least part of the outer layer in an outer region surrounding an inner region is provided with a crystallization promoter which, on heating of the quartz glass crucible during intended use in crystal pulling, causes crystallization of quartz glass with formation of cristobalite, characterized in that a first component acting in quartz glass – additionally to silicon – as network former and/or in quartz glass as network modifier, and an alkali-metal-free second component acting as breakpoint former in quartz glass is used as crystallization promoter, and that said

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components are introduced into and entrapped in a doping region (8) of the outer layer (6) having a layer thickness of more than 0.2 mm.

- 5 14. Method according to claim 13, characterized in that an outer layer (6) having the doping region (8) is generated in that SiO<sub>2</sub> grains are introduced into a melting mold and shaped therein into a crucible-shaped layer of SiO<sub>2</sub> grains, wherein said components are added to the SiO<sub>2</sub> grains before shaping of the doping region (8), and then the layer of SiO<sub>2</sub> grains is sintered with formation of the outer layer (G).
- 10 15. Method according to one of claims 13 or 14, characterized in that a tetravalent substance is used as the network-forming first component.
16. Method according to claim 15, characterized in that the tetravalent substance is titanium (Ti<sup>4+</sup>), zirconium (Zr<sup>4+</sup>), hafnium (Hf<sup>4+</sup>), germanium (Ge<sup>4+</sup>) and/or tin (Sn<sup>4+</sup>).
- 15 17. Method according to one of claims 13 to 16, characterized in that the second component acting as breakpoint former contains a divalent alkali-free-metal substance.
18. Method according to claim 17, characterized in that the divalent substance is barium (Ba<sup>2+</sup>) and/or strontium.
- 20 19. Method according to one of claims 13 to 18, characterized in that the first component and the second component are each introduced in a concentration ranging from 0.003 mol-% to 0.02 mol-% in the doping region.
- 25 20. Method according to one of claims 13 to 19, characterized in that the first component and the second component are contained in the doping region (8) of the outer layer (6) in the form of an oxide compound containing said components.
21. Method according to claim 20, characterized in that the oxide compound consists of a ternary oxide, such as barium titanate (BaTiO<sub>3</sub>) or barium zirconate (BaZrO<sub>3</sub>) or a mixture thereof.